Predicting Mill Feed Specific Energy from Bond Ball Mill Work Index Tests at Olympic Dam

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ABSTRACT

Ore hardness, like many other intrinsic ore properties, varies across a deposit, hence will also vary in ore delivered to the mill throughout the life of mine. There are a variety of laboratory-scale tests which assess comminution breakage properties, such as Bond Ball Mill Work Index (BWi), JK Drop Weight Index (DWi) and SMC Test®. The test outputs can be used to predict specific energy. During the early days of the Olympic Dam Geometallurgy program, results from BWi, DWi and SMC Test® tests were used to develop predictive relationships for BWi and DWi as functions of ore characteristics. There are now more than 1700 samples with BWi measurements. Regression models were developed based on sample bulk dry density (SG) and chemical composition, which predict BWi at the sample scale. The stope BWi and specific energy are then predicted from the block model estimates of stope SG and chemical composition.

Even though the processing plant does not see the full range of ore hardness displayed by the individual samples or stopes due to blending of stope ore during production, the specific energy at the mill does fluctuate according to the composition of ore fed to plant. The regression model effectively reflects this fluctuation which is evidenced by the correlation between actual mill feed specific energy and tonnes weighted stope average BWi of the ore feed over the same period. Currently the milling circuit is not the constraint at Olympic Dam. However, the ability to predict stope average BWi, carry it into the block model and hence into the mine plan can enable material blending among ‘hard’ and ‘soft’ ores to maintain plant feed hardness within the optimum range.